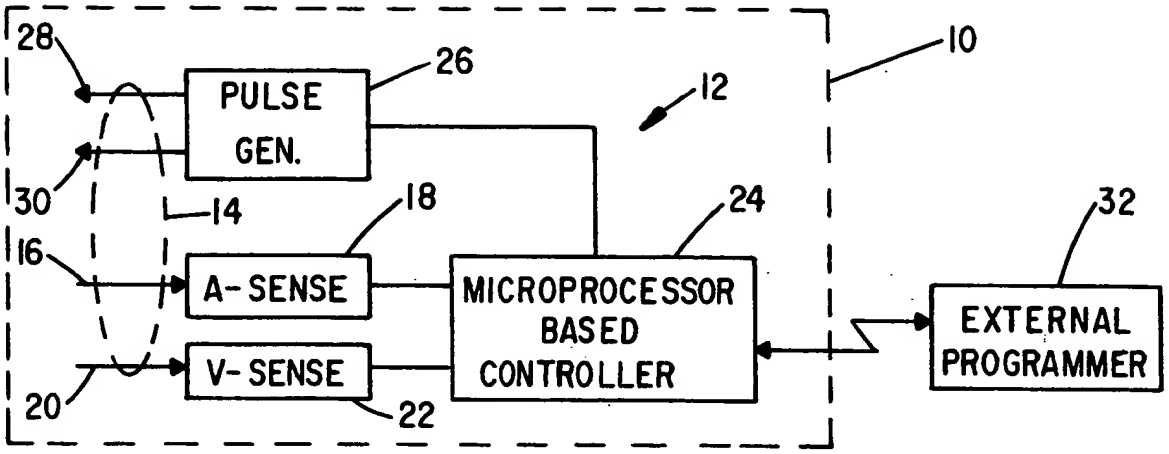
28
26
10
12
PULSE GEN.
30
14
18
24
32
16
A-SENSE
MICROPROCESSOR BASED CONTROLLER
EXTERNAL PROGRAMMER
V-SENSE
20
22

FIG. 1

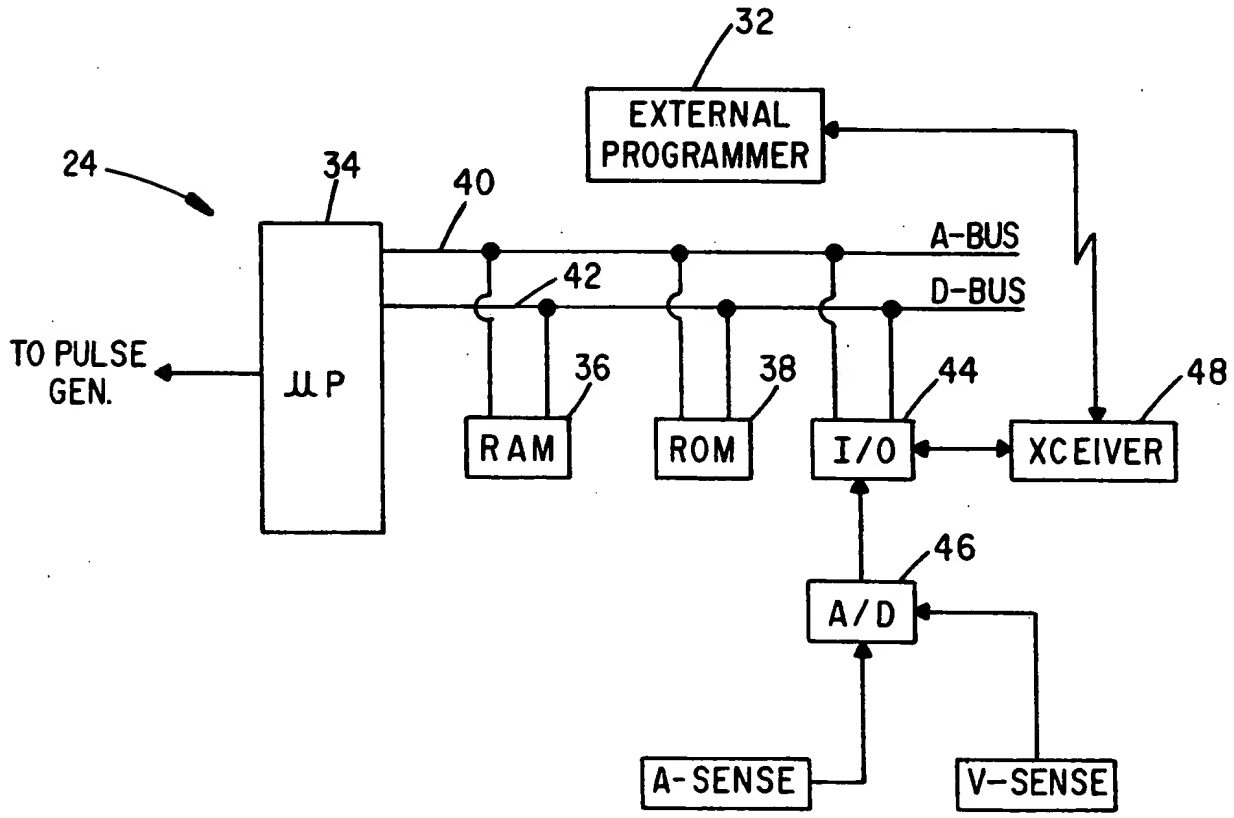
32
EXTERNAL PROGRAMMER
24
34
40
A-BUS
42
D-BUS
TO PULSE GEN.
μP
36
38
44
48
RAM
ROM
I/O
XCEIVER
46
A/D
A-SENSE
V-SENSE

FIG. 2

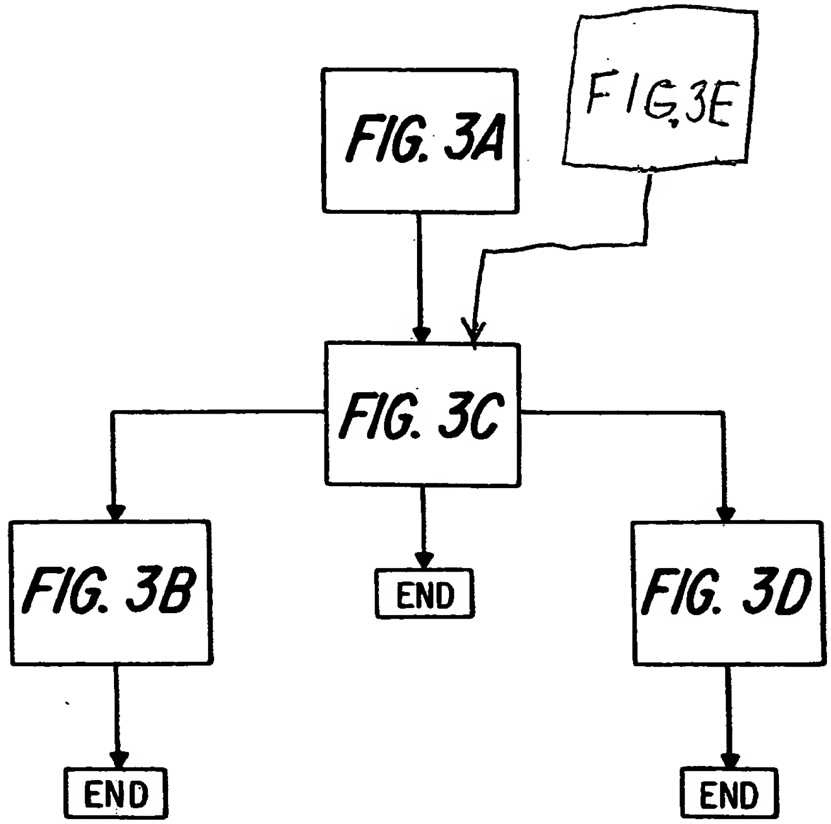

FIG. 3

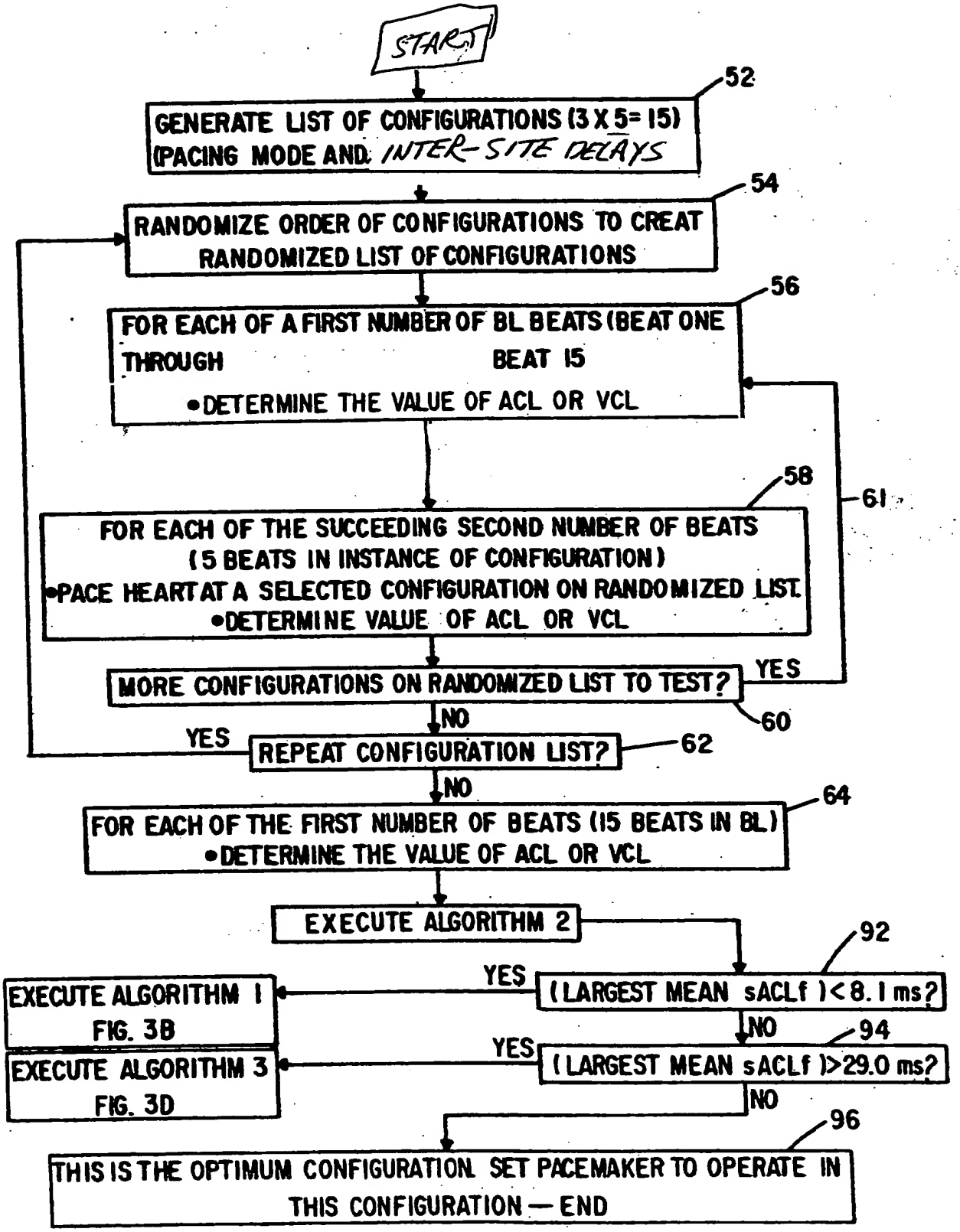
START
52
GENERATE LIST OF CONFIGURATIONS (3 X 5 = 15) (PACING MODE AND INTER-SITE DELAYS
54
RANDOMIZE ORDER OF CONFIGURATIONS TO CREAT RANDOMIZED LIST OF CONFIGURATIONS
56
FOR EACH OF A FIRST NUMBER OF BL BEATS (BEAT ONE THROUGH BEAT 15
•DETERMINE THE VALUE OF ACL OR VCL
58
FOR EACH OF THE SUCCEEDING SECOND NUMBER OF BEATS (5 BEATS IN INSTANCE OF CONFIGURATION)
•PACE HEART AT A SELECTED CONFIGURATION ON RANDOMIZED LIST
•DETERMINE VALUE OF ACL OR VCL
61
MORE CONFIGURATIONS ON RANDOMIZED LIST TO TEST?
YES
NO
60
YES
REPEAT CONFIGURATION LIST?
62
NO
64
FOR EACH OF THE FIRST NUMBER OF BEATS (15 BEATS IN BL)
•DETERMINE THE VALUE OF ACL OR VCL
EXECUTE ALGORITHM 2
92
YES
(LARGEST MEAN sACLf) < 8.1 ms?
EXECUTE ALGORITHM 1 FIG. 3B
NO
94
YES
(LARGEST MEAN sACLf) > 29.0 ms?
EXECUTE ALGORITHM 3 FIG. 3D
NO
96
THIS IS THE OPTIMUM CONFIGURATION SET PACEMAKER TO OPERATE IN THIS CONFIGURATION — END

FIG. 3A

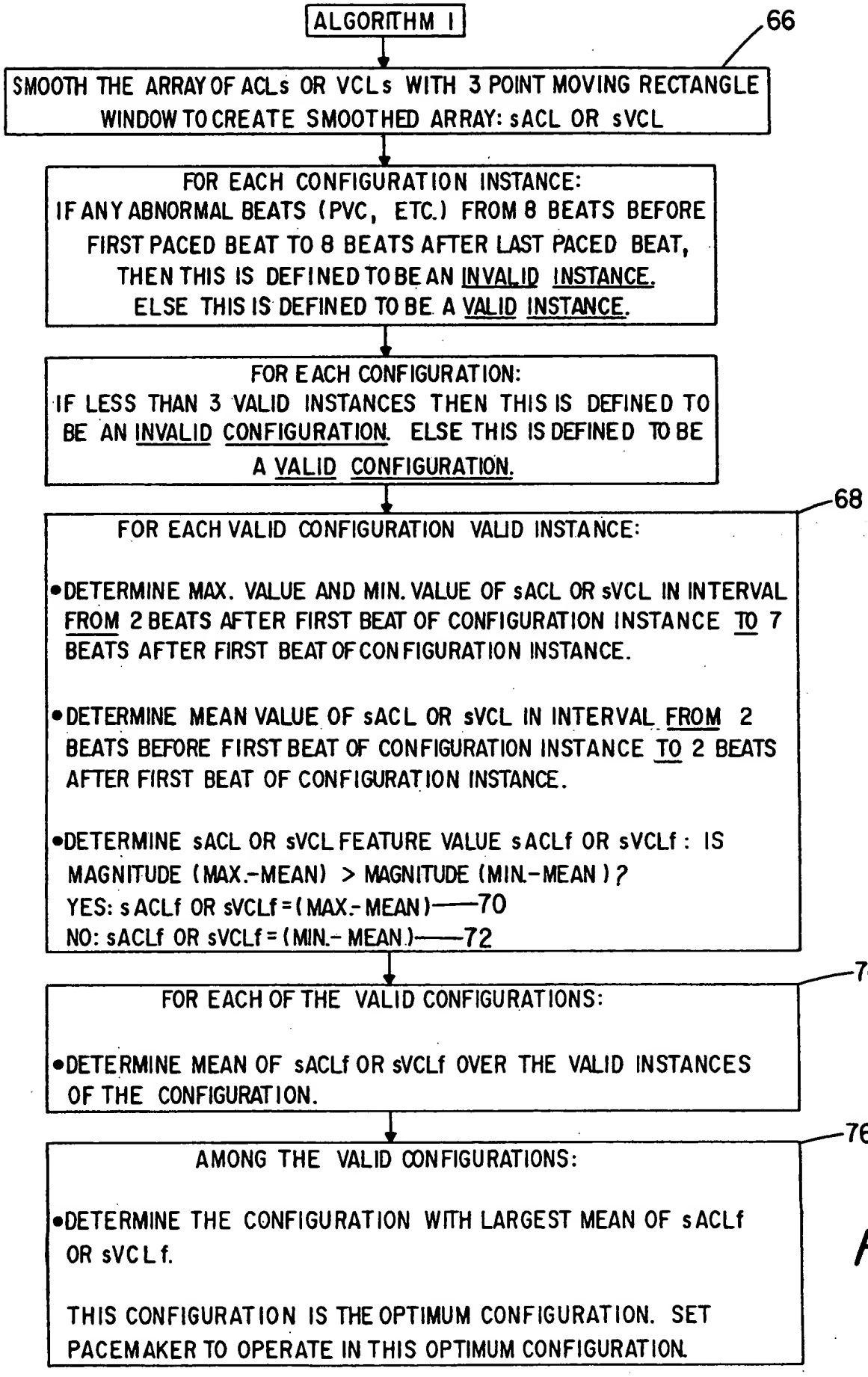
ALGORITHM I
66
SMOOTH THE ARRAY OF ACLs OR VCLs WITH 3 POINT MOVING RECTANGLE WINDOW TO CREATE SMOOTHED ARRAY: sACL OR sVCL
FOR EACH CONFIGURATION INSTANCE:
IF ANY ABNORMAL BEATS (PVC, ETC.) FROM 8 BEATS BEFORE FIRST PACED BEAT TO 8 BEATS AFTER LAST PACED BEAT, THEN THIS IS DEFINED TO BE AN INVALID INSTANCE.
ELSE THIS IS DEFINED TO BE A VALID INSTANCE.
FOR EACH CONFIGURATION:
IF LESS THAN 3 VALID INSTANCES THEN THIS IS DEFINED TO BE AN INVALID CONFIGURATION. ELSE THIS IS DEFINED TO BE A VALID CONFIGURATION.
68
FOR EACH VALID CONFIGURATION VALID INSTANCE:
•DETERMINE MAX. VALUE AND MIN. VALUE OF sACL OR sVCL IN INTERVAL FROM 2 BEATS AFTER FIRST BEAT OF CONFIGURATION INSTANCE TO 7 BEATS AFTER FIRST BEAT OF CONFIGURATION INSTANCE.
•DETERMINE MEAN VALUE OF sACL OR sVCL IN INTERVAL FROM 2 BEATS BEFORE FIRST BEAT OF CONFIGURATION INSTANCE TO 2 BEATS AFTER FIRST BEAT OF CONFIGURATION INSTANCE.
•DETERMINE sACL OR sVCL FEATURE VALUE sACLf OR sVCLf: IS MAGNITUDE (MAX.-MEAN) > MAGNITUDE (MIN.-MEAN)?
YES: sACLf OR sVCLf = (MAX.- MEAN) 70
NO: sACLf OR sVCLf = (MIN.- MEAN) 72
74
FOR EACH OF THE VALID CONFIGURATIONS:
•DETERMINE MEAN OF sACLf OR sVCLf OVER THE VALID INSTANCES OF THE CONFIGURATION.
76
AMONG THE VALID CONFIGURATIONS:
•DETERMINE THE CONFIGURATION WITH LARGEST MEAN OF sACLf OR sVCLf.
THIS CONFIGURATION IS THE OPTIMUM CONFIGURATION. SET PACEMAKER TO OPERATE IN THIS OPTIMUM CONFIGURATION.

FIG. 3B

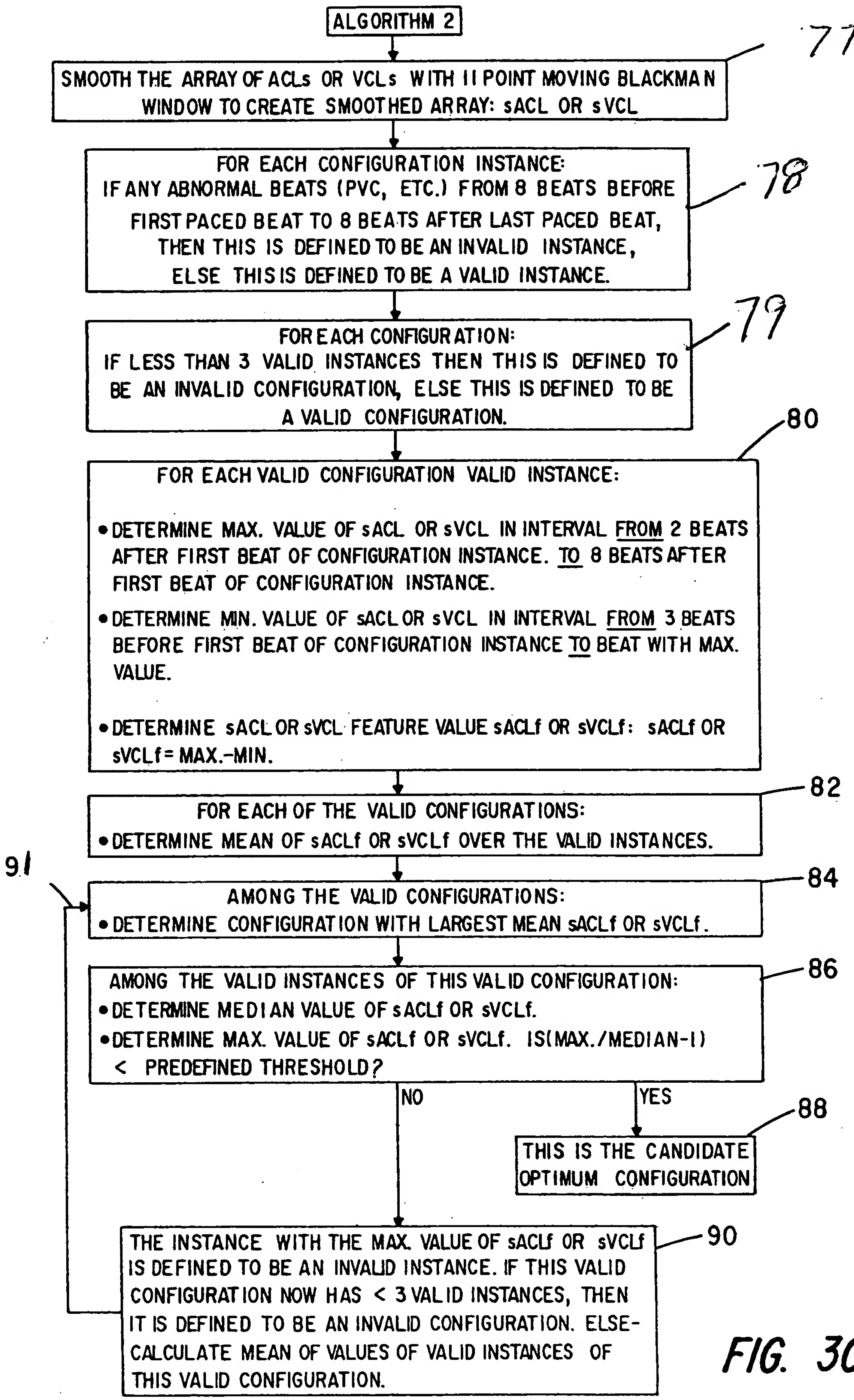
ALGORITHM 2
SMOOTH THE ARRAY OF ACLs OR VCLs WITH 11 POINT MOVING BLACKMAN WINDOW TO CREATE SMOOTHED ARRAY: sACL OR sVCL
77
FOR EACH CONFIGURATION INSTANCE: IF ANY ABNORMAL BEATS (PVC, ETC.) FROM 8 BEATS BEFORE FIRST PACED BEAT TO 8 BEATS AFTER LAST PACED BEAT, THEN THIS IS DEFINED TO BE AN INVALID INSTANCE, ELSE THIS IS DEFINED TO BE A VALID INSTANCE.
78
FOR EACH CONFIGURATION: IF LESS THAN 3 VALID INSTANCES THEN THIS IS DEFINED TO BE AN INVALID CONFIGURATION, ELSE THIS IS DEFINED TO BE A VALID CONFIGURATION.
79
FOR EACH VALID CONFIGURATION VALID INSTANCE:
• DETERMINE MAX. VALUE OF sACL OR sVCL IN INTERVAL FROM 2 BEATS AFTER FIRST BEAT OF CONFIGURATION INSTANCE. TO 8 BEATS AFTER FIRST BEAT OF CONFIGURATION INSTANCE.
• DETERMINE MIN. VALUE OF sACL OR sVCL IN INTERVAL FROM 3 BEATS BEFORE FIRST BEAT OF CONFIGURATION INSTANCE TO BEAT WITH MAX. VALUE.
• DETERMINE sACL OR sVCL FEATURE VALUE sACLf OR sVCLf: sACLf OR sVCLf = MAX.-MIN.
80
FOR EACH OF THE VALID CONFIGURATIONS:
• DETERMINE MEAN OF sACLf OR sVCLf OVER THE VALID INSTANCES.
82
AMONG THE VALID CONFIGURATIONS:
• DETERMINE CONFIGURATION WITH LARGEST MEAN sACLf OR sVCLf.
84
91
AMONG THE VALID INSTANCES OF THIS VALID CONFIGURATION:
• DETERMINE MEDIAN VALUE OF sACLf OR sVCLf.
• DETERMINE MAX. VALUE OF sACLf OR sVCLf. IS(MAX./MEDIAN-1) < PREDEFINED THRESHOLD?
86
NO
YES
THIS IS THE CANDIDATE OPTIMUM CONFIGURATION
88
THE INSTANCE WITH THE MAX. VALUE OF sACLf OR sVCLf IS DEFINED TO BE AN INVALID INSTANCE. IF THIS VALID CONFIGURATION NOW HAS < 3 VALID INSTANCES, THEN IT IS DEFINED TO BE AN INVALID CONFIGURATION. ELSE-CALCULATE MEAN OF VALUES OF VALID INSTANCES OF THIS VALID CONFIGURATION.
90

FIG. 3C

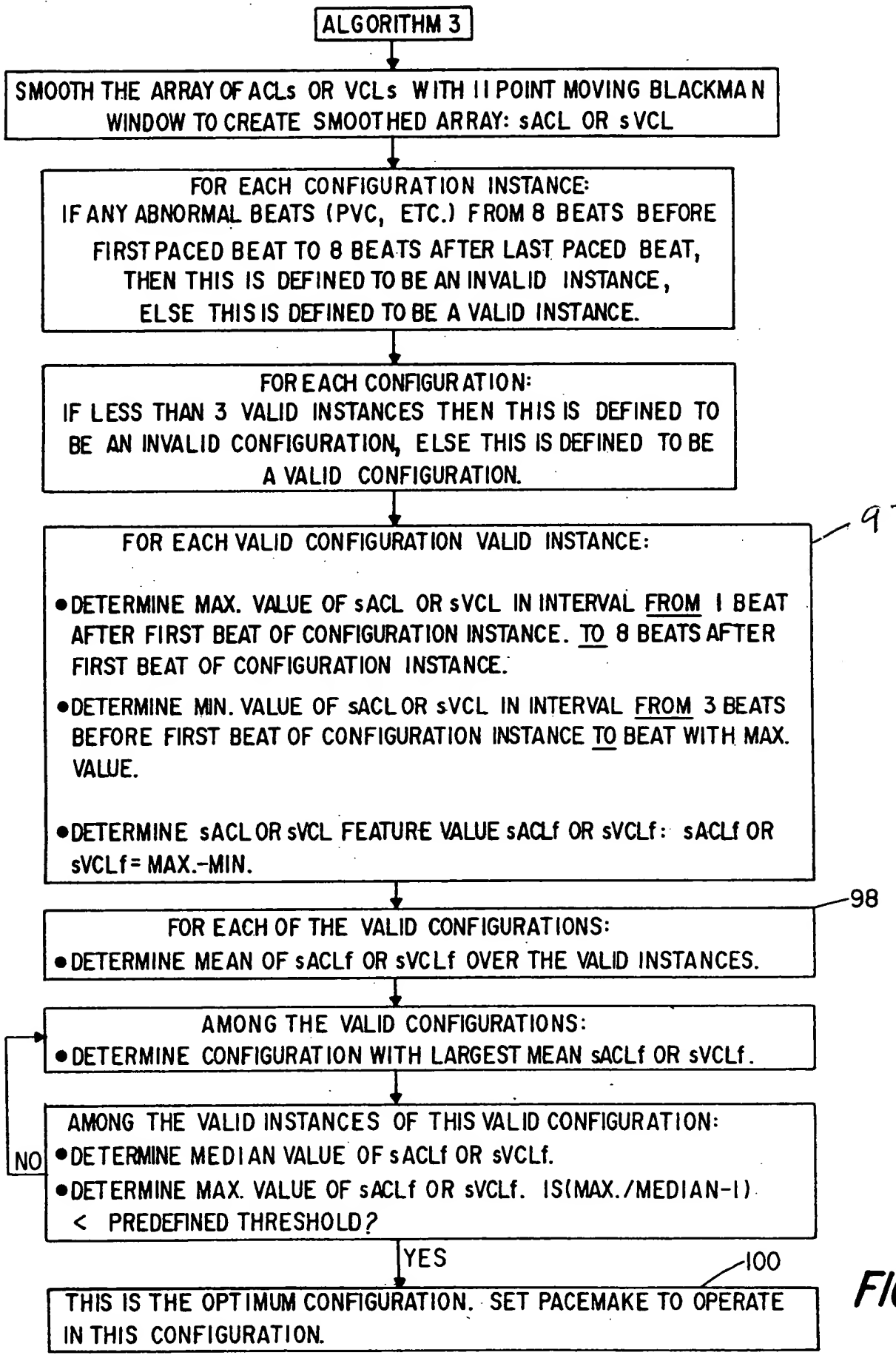
ALGORITHM 3
SMOOTH THE ARRAY OF ACLs OR VCLs WITH 11 POINT MOVING BLACKMAN WINDOW TO CREATE SMOOTHED ARRAY: sACL OR sVCL
FOR EACH CONFIGURATION INSTANCE:
IF ANY ABNORMAL BEATS (PVC, ETC.) FROM 8 BEATS BEFORE FIRST PACED BEAT TO 8 BEATS AFTER LAST PACED BEAT, THEN THIS IS DEFINED TO BE AN INVALID INSTANCE, ELSE THIS IS DEFINED TO BE A VALID INSTANCE.
FOR EACH CONFIGURATION:
IF LESS THAN 3 VALID INSTANCES THEN THIS IS DEFINED TO BE AN INVALID CONFIGURATION, ELSE THIS IS DEFINED TO BE A VALID CONFIGURATION.
97
FOR EACH VALID CONFIGURATION VALID INSTANCE:
• DETERMINE MAX. VALUE OF sACL OR sVCL IN INTERVAL FROM 1 BEAT AFTER FIRST BEAT OF CONFIGURATION INSTANCE. TO 8 BEATS AFTER FIRST BEAT OF CONFIGURATION INSTANCE.
• DETERMINE MIN. VALUE OF sACL OR sVCL IN INTERVAL FROM 3 BEATS BEFORE FIRST BEAT OF CONFIGURATION INSTANCE TO BEAT WITH MAX. VALUE.
• DETERMINE sACL OR sVCL FEATURE VALUE sACLf OR sVCLf: sACLf OR sVCLf = MAX.-MIN.
98
FOR EACH OF THE VALID CONFIGURATIONS:
• DETERMINE MEAN OF sACLf OR sVCLf OVER THE VALID INSTANCES.
AMONG THE VALID CONFIGURATIONS:
• DETERMINE CONFIGURATION WITH LARGEST MEAN sACLf OR sVCLf.
AMONG THE VALID INSTANCES OF THIS VALID CONFIGURATION:
• DETERMINE MEDIAN VALUE OF sACLf OR sVCLf.
• DETERMINE MAX. VALUE OF sACLf OR sVCLf. IS(MAX./MEDIAN-1) < PREDEFINED THRESHOLD?
NO
YES
100
THIS IS THE OPTIMUM CONFIGURATION. SET PACEMAKE TO OPERATE IN THIS CONFIGURATION.

FIG. 3D

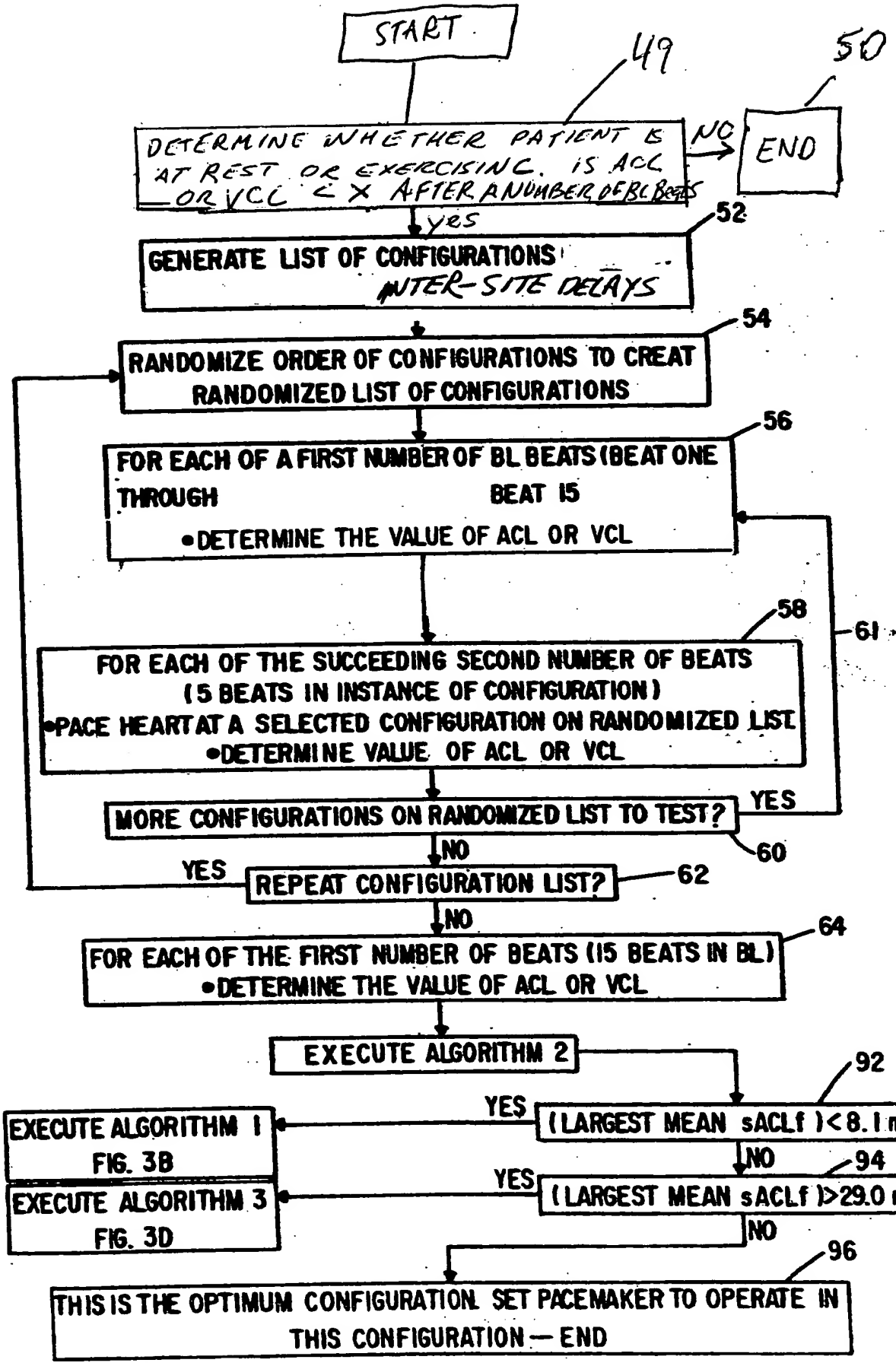
START
49
50
DETERMINE WHETHER PATIENT IS AT REST OR EXERCISING. IS ACL OR VCL < X AFTER A NUMBER OF BL BEATS
NO
END
yes
52
GENERATE LIST OF CONFIGURATIONS INTER-SITE DELAYS
54
RANDOMIZE ORDER OF CONFIGURATIONS TO CREAT RANDOMIZED LIST OF CONFIGURATIONS
56
FOR EACH OF A FIRST NUMBER OF BL BEATS (BEAT ONE THROUGH BEAT 15
•DETERMINE THE VALUE OF ACL OR VCL
58
61
FOR EACH OF THE SUCCEEDING SECOND NUMBER OF BEATS (5 BEATS IN INSTANCE OF CONFIGURATION)
•PACE HEART AT A SELECTED CONFIGURATION ON RANDOMIZED LIST
•DETERMINE VALUE OF ACL OR VCL
MORE CONFIGURATIONS ON RANDOMIZED LIST TO TEST?
YES
60
NO
YES
REPEAT CONFIGURATION LIST?
62
NO
64
FOR EACH OF THE FIRST NUMBER OF BEATS (15 BEATS IN BL)
•DETERMINE THE VALUE OF ACL OR VCL
EXECUTE ALGORITHM 2
92
YES
(LARGEST MEAN sACLf)<8.1 ms?
EXECUTE ALGORITHM 1 FIG. 3B
NO
94
YES
(LARGEST MEAN sACLf)>29.0 ms?
EXECUTE ALGORITHM 3 FIG. 3D
NO
96
THIS IS THE OPTIMUM CONFIGURATION. SET PACEMAKER TO OPERATE IN THIS CONFIGURATION — END

FIG. 3E

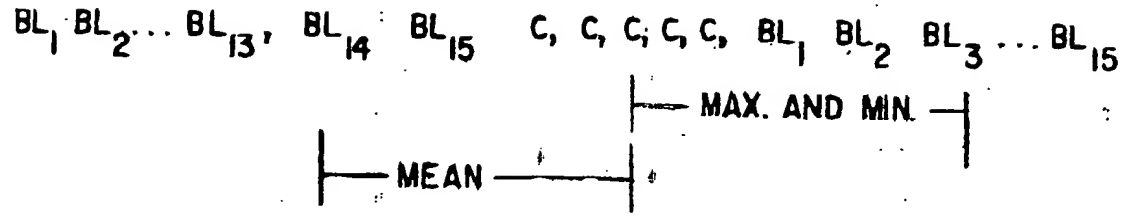
BL1 BL2 ... BL13, BL14 BL15 C, C, C, C, C, BL1 BL2 BL3 ... BL15
MAX. AND MIN.
MEAN

FIG. 4

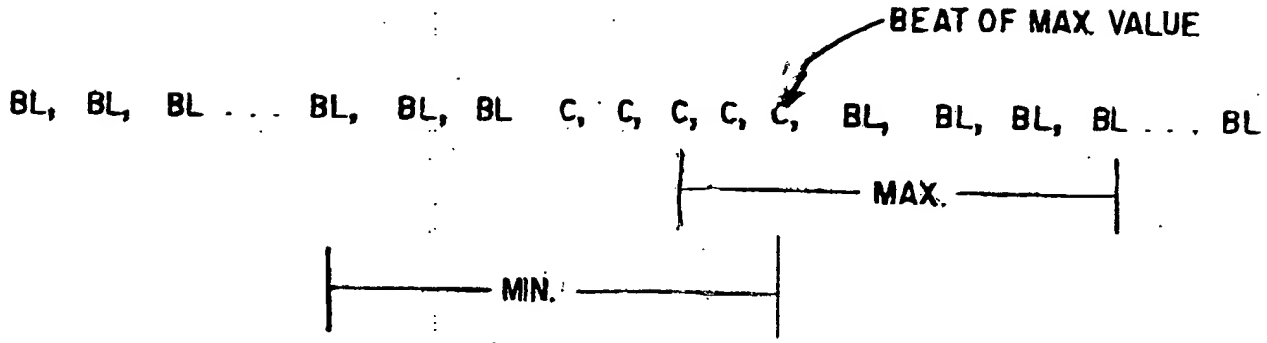
BEAT OF MAX. VALUE
BL, BL, BL ... BL, BL, BL C, C, C, C, C, BL, BL, BL, BL ... BL
MAX.
MIN.

FIG. 5

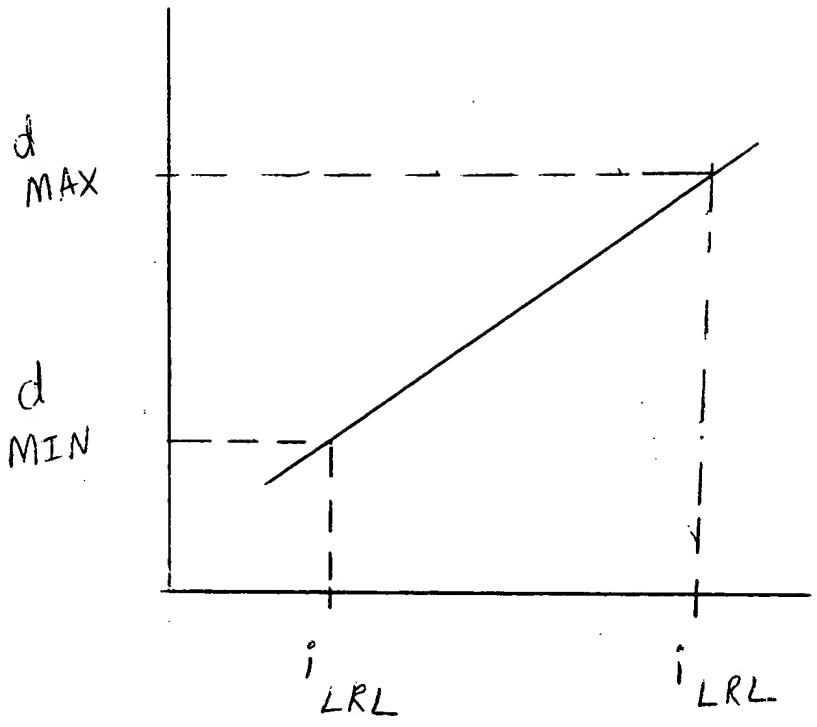

Fig 6